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SUBCOMMITTEE FOR SPECIAL INVESTIGATIONS

OF THE

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HEARINGS HELD DECEMBER 2 AND 5, 1958

ON

AIRSTRIP PAVING MATERIALS

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AIRSTRIP PAVING MATERIALS

Report of the Subcommittee for Special Investigations, House Armed Services Committee

Hearings of December 2 and 5, 1958, by this subcommittee of the 85th Congress are reviewed and reported upon.

The testimony appears in the hearings of those dates which were printed and published January 3, 1959.

After reviewing that testimony, we report, conclude, and recommend as follows:

REPORT

The House Armed Services Special Investigating Subcommittee became concerned with the exclusion of alternate materials for airstrip runways, and commenced an inquiry on February 3, 1954.

After full hearings, all witnesses agreed and the subcommittee so reported on May 21, 1954, that portland cement concrete was (on engineering data) necessary to be used exclusively on runway landing ends, taxiways, and warmup aprons.

The reason assigned for this choice was on account of fuel spillage, as well as weight and repetitive use.

The weight of testimony and engineering data support our conclusion that in the noncritical areas, i.e., airstrip runways asphalt of adequate consistency and load design should be bid as an alternate and considered on price.

Our report containing this conclusion was sent to the Department of the Air Force on May 25, 1954.

On August 16, 1954, the Department of the Air Force came into agreement with the subcommittee. (See Air Force letter of August 16, 1954, which follows.)

DEPARTMENT OF THE AIR FORCE,
Washington, August 16, 1954.

Hon. WILLIAM E. HESS,
Chairman, Subcommittee on Defense Activities, Committee on Armed Services, House of Representatives.

DEAR MR. CHAIRMAN: On July 30, 1954, in answer to inquiry from you concerning the Air Force's continued use of a 5-percent differential in favor of concrete versus asphalt as an airstrip paving material, I informed you that we would complete a reevaluation of this paving subject during the month of August.

This is to inform you that we have completed a review of all available information from the field which has a bearing on the subject. While we are completely convinced that 100-percent concrete paving has a definite advantage as compared to a combination of concrete in the critical areas and asphalt in the noncritical areas, we have been unable to collect adequate engineering backup, as reflected by maintenance costs, to substantiate this view. It is apparent that the problem does not lend itself to a simple conclusive solution based on the facts secured by this short-term study. We have, therefore, suspended premium payments for cement concrete in noncritical runway airfield areas. Instructions are being prepared for issuance to all Air Force and Corps of Engineers personnel concerned.

It is my understanding that this action is in accordance with the views of your committee which held hearings and secured information from many interested sources.

Sincerely yours,

JOHN M. FERRY,
Special Assistant for Installations.

COMPETITIVE BIDDING

It was estimated in responsible quarters that the savings thus effected would approximate $50 million on the then existing construction program.

It seems to be generally agreed that asphalt runways can be installed at less than the cost of cement. After the decision of August 16, 1954, to ask for alternates on cement and asphalt runways, succeeding competitive bidding resulted in a drop in some cement bids of approximately 4 percent over what was considered to be the market.

In other words, after the premium differential of 5 percent was removed and competition restored, the Government saved not only the 5 percent differential but got cement at 4 percent less cost; a total swing downward of 9 percent in competition.

However, this alternate bidding was abandoned by the Air Force in 1956 without any advice to this subcommittee. Our first information was in an announcement to the House Appropriations Committee, on February 1956, by the Chief of Air Installations that the Air Force was "essentially operating a concrete paving program, especially in the United States."

1957 SUBCOMMITTEE HEARINGS

This subject came before the subcommittee again on June 24 and July 3, 1957. At that time the "new requirements" of the Air Force and the "reevaluation" of its requirements was the subject of open hearing. The testimony was inconclusive.

On August 14, 1957, the subcommittee issued a second report. It cautioned against heavy commitments for a cement runway paving program. It endorsed the proposal of the Army Corps of Engineers and the Air Force, with full information to the industry, for a test on construction criteria for asphalt runway pavement which could meet the "new requirements" of the Air Force.

The subcommittee convened again on January 8, 1958, and received further information on that test, which was then underway.

This test was concluded in November 1958. Both the Department of Air Force and the Corps of Engineers, U.S. Army, agreed on conclusions.

CONCLUSIONS OF CORPS OF ENGINEERS

The conclusions of the Corps of Engineers, U.S. Army, were presented by Maj. Gen. Walter K. Wilson, Jr., and Brig. Gen. Edward A. Brown, his deputy. The conclusions and recommendations are as follows:

1. Considering normal B–52 operations only, we have concluded that the tests at Columbus Air Force Base demonstrated the validity of the design and construction procedures developed by the Corps of Engineers for heavy-load flexible runway interior pavements.

2. Runway pavements must, however, be capable of supporting incidental periods of B–52 taxi operation in addition to the normal landing and takeoff traffic. The tests indicated that objectionable differential settlement could possibly develop on runways where taxi operations are extended over a period of 6 months or longer.

3. The flexible-pavement surface in the immediate vicinity of the buried-slab transition between the flexible and rigid pavement sections developed a ⅝-inch depression across the width of the traffic test lane.

4. An average 1¼-inch subsidence of the flexible pavement in the traffic lane, combined with a peculiarity of the test traffic pattern, resulted in excessive differential settlement between the trafficked area and the nontrafficked area to either side. The abrupt change in surface elevation would not be expected under normal B–52 operations but would be a possibility under extended taxi operations.

5. The surface smoothness within the traffic lane itself after completion of the test complied essentially with the smoothness tolerance allowed during construction.

6. The Corps of Engineers feels that the pavements were designed and constructed under as representative conditions as possibly, considering the unusually large number of sidewalk superintendents from both Government and industry.

7. The test was not intended to show an economic comparison between rigid and flexible pavement. Any such comparison based upon experience at Columbus Air Force Base would have little worldwide application. Local conditions will determine the economics.

8. The test was conceived and planned to establish the capability of flexible runway interior pavements only. The Corps of Engineers has not altere its position that primary taxiways and runway ends on heavy-load airfields should be constructed of rigid pavement except in exceptional geographic areas.

9. The Corps of Engineers has concluded that it is possible to construct heavy-load flexible runway interior pavement that will provide adequate service for normal B–52 operations. However, B–52 operational conditions may occur that could cause objectionable roughness in flexible pavement because of differential settlement. Therefore, as a general policy, we are in agreement with the Air Force that a center strip of rigid pavement in runway interiors is good insurance.

CONCURRENCE OF AIR FORCE IN CORPS OF ENGINEERS REPORT

The official statement of concurrence by the Department of Army in the conclusions of the Corps of Engineers arrived at as a result of the Columbus Air Force Base test reported December 2, 1958, set forth above was given in writing to the subcommittee by John M. Ferry, Special Assistant for Installations, Department of the Air Force. The Air Force statement is as follows:

Representatives of the Air Force, including myself, have observed the proof test section at Columbus Air Force Base at various times before, during, and after the test rolling. We have studied the report of the Corps of Engineers and concur in this report. It is a clear statement of facts, of conditions, and the results. The conclusions drawn from the results of the test and presented by General Wilson and General Brown are generally concurred in.

We do have reservations regarding the probable durability of the leaner mix used in the asphaltic concrete. That is to say, we cannot be sure that the degree of reduced durability of the newer mixes will be in the order of only 2 or 3 years, as compared with a pavement constructed with a richer mix which is considered to have 20-year durability. However, as so aptly pointed out by General Wilson, there is no known accelerated test which can prove or disprove this appraisal.

I would like to present to you certain aspects of aircraft operations which have a definite bearing on OCE's conclusions. You will recall that General Wilson stated that B–52 operational conditions may occur which could cause objectionable roughness in flexible pavement because of differential settlement. Such operations do occur quite regularly. For example:

(*a*) There are many instances where a portion of a runway is used as a taxiway while construction or repair is in progress on the runway or taxi system. This has been brought out by General Wilson's questioning.

(*b*) Under the current alert procedures as established earlier this year, fully loaded aircraft are required to simulate takeoffs at frequent intervals. In these

cases engines are run up at full power and are then decelerated. Then the aircraft is taxied down the runway and back to its position on the ramp. Here the runway is subjected to the loading characteristic which occurs on taxiways.

(*c*) Out of the total number of scheduled missions per month a certain percentage will be aborted. Many of these occur at takeoff and the aircraft fail to get off the ground. This means that the aircraft in its fully loaded condition must travel down the runway. The braking and deceleration action involved in such a maneuver exerts severe shearing forces on the pavement. This can and does result in a washboard effect on asphaltic concrete. It becomes most pronounced during hot weather.

(*d*) Frequently aircraft awaiting takeoff are required to clear the runway for an emergency or other similar situation. Here again we have very heavy aircraft taxiing down the runway.

These operational conditions do and will continue to exist. With flexible pavement, we would expect rutting and roughness beyond acceptability with regard to safe aircraft operations.

Attention is invited to the fact that each B–52 takeoff involves (1) an aircraft worth approximately $7,100,000, not counting the value of the payload; (2) a load approaching 500,000 pounds which has to be accelerated to approximately 170 miles per hour on the runway to reach flying speed; and (3) the lives of the six crew members. The successful launching of this weapon requires a high degree of skill by the pilot.

Rough or uneven pavement surfaces have the following effects on our SAC operations:

(*a*) The structure of the aircraft and the precision instruments and equipment are subjected to sharp shocks and jolts.

(*b*) Oscillations are set up in the aircraft, resulting in "porpoising." This causes a redistribution of weight between the front and rear gears.

(*c*) During the latter part of the ground run, the aircraft pitches and bucks so that the pilot cannot maintain full control of the aircraft because he is forced to "hang on" until the aircraft breaks ground.

(*d*) Aircraft are sometimes pitched into the air before they have gained sufficient flying speed to safely leave the runway.

For these reasons, our B–52 and B–47 pilots have much greater confidence when operating from rigid pavements. Such confidence plays an extremely important part in the successful accomplishment of SAC's defense mission.

In summary, it is the Air Force position that all portland cement concrete runways are preferable for the reasons stated; but where a substantial economy is possible by using a combination of rigid and flexible paving it is a reasonable decision to build a center strip of portland cement concrete pavement between the concrete ends, with asphaltic concrete pavement on the sides, both sides. [Emphasis supplied.]

That is the Air Force position, sir. * * *

This statement of concurrence by the Air Force is, on the face of it, assuring. However, as usual, putting it into practice is something else again.

We note that while there are three paragraphs of concurrence, there are many reasons later assigned why wholehearted acceptance may not be expected.

The following colloquy is illustrative of reason for the subcommittee's concern. The Columbus test was agreed upon in detail. The conclusions from it have been concurred in by the Corps of Engineers and Air Force. Now comes the next step. Are these two materials now to be bid competitively?

Mr. HÉBERT. As to the Air Force's position, you do accept that where an economy is involved, you could use the asphalt pavement?

Mr. FERRY. Yes, sir.

Mr. HÉBERT. And you would do it?

Mr. FERRY. Yes, sir.

Mr. HÉBERT. But how would you do it if you don't get competitive bids?

Mr. FERRY. We can estimate before we have actually designed the pavement, knowing the comparable costs of the construction of both rigid and flexible in the particular area under question.

Mr. HÉBERT. How do you know, if you don't ask them?

Mr. FERRY. We turn to our friend, the Corps of Engineers, sir, on this and say, "What is your estimate, or engineer estimate of the cost of rigid and concrete

per square yard?" And they, based upon their own experience in that area, and frequently after consultation with local contractors, come up with an estimate of cost which, if there is a wide differential, we would not take competitive bids. If, however, the differential was slight, we would take competitive bids.

Mr. HÉBERT. Well, have you taken competitive bids recently?

Mr. FERRY. In many cases, sir.

Mr. HÉBERT. You are doing that right now?

Mr. FERRY. Yes, sir.

Mr. HÉBERT. There is one thing that puzzles me and that is how estimates don't mean anything.

Mr. FERRY. Good estimators can come up pretty close, sir.

Mr. HÉBERT. There is no reason to have bids or anything, if you can have Government estimators.

Mr. FERRY. *There is a difference. The Government estimates under average conditions. He is not affected by the availability of equipment. He is not affected by the lack or ability of the contractor to get other work. In other words, if a contractor is hungry, he may bid lower than a contractor who has plenty of work on his books for the next 6 months. So nobody can ever foresee what the actual contract bid will be. We can only make our best estimate on average conditions.* [Emphasis supplied.]

Mr. HÉBERT. That is the point I am making. If you don't actually get the bids you don't know what the savings will be.

Mr. FERRY. Again I point out to you, Mr. Hébert, that if the estimate of cost has a wide differential between the two, it is obvious that they can't be pulled together by the bidding. If there is a narrow differential between the cost estimates, it is clear that it would be wise to take alternate bids.

Mr. HÉBERT. Well, what percentage range would you consider——

Mr. FERRY. If they came in within 10 percent of each other, sir. I would think it wise indeed to take alternate bids.

NAVY DEPARTMENT

The Department of the Navy's Bureau of Yards and Docks sat through all of our hearings. They were fully aware of the test which was conducted. They have gone so far as to evaluate it partially. But somehow Navy never got around to suggesting a test of hard surfacing, at the same time. So, in May 1958, the subcommittee "accidentally" came upon a document circulated through the Navy Department, announcing its new runway paving program for tire pressures over 250 pounds because asphalt surfaces were said to be not tough enough for these tire pressures. This was a proposal for a substantial departure from the Navy's policy as stated to the subcommittee earlier.

Rear Adm. Eugene J. Peltier, Chief of Bureau of Yards and Docks, on December 2, 1958, testified as follows:

> In summary, it is the policy of the Bureau of Yards and Docks to use both flexible-type and rigid-type pavements. Navy experience with runways subjected to high tire pressures, over 250 pounds per square inch, has led to the use of rigid type pavements for this type of traffic. However, our position in this regard is open, if it can be demonstrated that flexible type pavements can perform satisfactorily for traffic with high-pressure tires.

Of the report of May 1958, the Admiral testified:

> Admiral PELTIER. That report was not intended for what it is being used. As Mr. Hébert said this morning, he accidentally got hold of it. It was our own internal report.
>
> Mr. HÉBERT. Is there any secret about it we shouldn't know?
>
> Admiral PELTIER. No, sir. Except we probably would have edited it a little tighter if we knew it was going to get this much publicity.

The subcommittee is gravely concerned at the lack of coordination and collaboration with the Corps of Engineers, the Air Force, and this subcommittee, on the testing and engineering studies which were

going on with the full knowledge of the Navy and at the very time it embarked on this program of its own.

The seriousness of such waste cannot be overemphasized. The duplication is almost inexcusable.

The Navy report of May 1958 shows that 42 naval air stations are paved with asphalt. The same report shows that only an insignificant few of these fields have been complained about for such things as abrasion, scuffing, rutting, raveling, and grooving. As to these, the complaints range from slight to minor.

In these circumstances, it must be embarrassing to the Chief of the Bureau to be found in such a position.

When did superhard tires creep up on the Navy? What research has been done on tougher surfaces? How long will these hard tires be with us? What does the Navy propose to do with almost nine-tenths of its runways surfaced in asphalt?

We think the Chief of the Bureau was understandably concerned that the subcommittee should have come upon this document. The survey which it contains is a poor job. Finding fault with its own past should not leave such an eminent array of talent without resource or recourse. Perhaps the Seabees should be reactivated.

INDUSTRY COMMENTS

(*a*) *The Cement Association*

The Portland Cement Association was asked to comment upon the Columbus test. Its comments were inadequate. The most eloquent portions were omitted.

The subcommittee was advised not to substitute its judgment for that of this association; and to accept concrete as the only answer to all problems as a material, which, regardless of cost, was without fault or without flaw.

Our introduction to this conclusion of the association was an announcement that two B–52 airplanes had crashed. No statement was made as to what caused these crashes. We were supposed to guess that they resulted from pavement failures, perhaps! When that question was asked, the association did not know the cause of either crash. Later information was that pavement failure was not involved.

We were advised that concrete "could take it." So, presumably, could we!

The subcommittee heard no discussion from this organization on such matters of concern as critical thickness of slabs, effect of ground temperatures on various thicknesses, method and time of year for pouring cement, joint sealing or spalling, to mention a few.

The subcommittee inquired about two recently constructed concrete runways. One was at Grand Forks, N. Dak., constructed in 1957 and out of operation for parts of 1957 and 1958. The association reported that "less than 1 percent of the runway was affected"; i.e., that 138 panels out of 15,207 panels were defective. What the association did not say was that these 138 panels were so dispersed that the runway was inoperable. Nor were we told whether and when repairs could be made because of low temperatures.

We inquired about Duluth, Minn., Air Force Base. Again we were advised that less than 1 percent of the runway was affected. There

were admittedly 256 linear feet of "minor cracks and grooves" which cost $40,000 to repair; but we were not told these cracks and grooves were so distributed that the whole runway was inoperable.

This testimony, to say the least, did very little credit to its authors.

(*b*) *The asphalt associations*

The Asphalt Association and the Bituminous Contractors Association witnessed tests. Representatives of these associations asked for an opportunity to bid competitively.

FEDERAL AGENCIES

So far as the subcommittee is aware, everyone having an interest in this subject was invited to appear and submit comments. That includes the Bureau of Public Roads and other Federal agencies, in any way related to or concerned with the subject.

OBSERVATIONS AND COMMENT

Spain

Almost every member of this subcommittee and most of the members of the House Armed Services Committee have seen the Spanish Air Force bases, now almost all completed and operational.

We cannot be unmindful that B–52's, B–47's, jets of all numbers, and tankers are flying off these fields without incident.

Notwithstanding the shock treatment we have received, these bases are operational. These long runways are built of asphalt.

Economy

Nor can we be insensible to the fact that all signs point to a diminishing number of heavy bombers. Dispersal imposes fewer repetitive uses of individual fields.

Our military policy ought to be coordinated with the construction program, so that we will have what we need, when and where we need it, at an economical cost.

The U.S. Army Engineers have not failed in engineering before. Their conclusions deserve weight and consideration, without prejudice.

Competitive bidding on alternates

Notwithstanding Air Force acceptance of the conclusions of the Corps of Engineers, it now proposes that there be a Government estimate, to which the bidders will not be privy; and that upon that estimate it will determine whether to ask for alternate bids.

That is just what the construction industry condemns. It is what we condemn. Asphalt design and material criteria have been agreed upon. Let industry settle the price for itself. All that is proposed is that the market prices be determined in the market.

A bidder may choose to bid. No one will force him. What could be wrong with using the tool which we have been given (acceptable engineering criteria) and specifying it, just as everything else is specified in construction bids? Let the construction industry give its answer and its performance bond with it.

Why aren't the taxpayers entitled to that much of a break on bidding and pricing?

CONCLUSIONS

The subcommittee concludes as follows:

1. The Corps of Engineers of the U.S. Army and the Department of the Air Force having come into agreement on the result of the test reported December 2, 1958, the subcommittee accepts and adopts the engineering conclusions submitted.

2. Neither the Air Force nor this subcommittee is warranted in substituting their judgment for that of the Corps of Engineers on whether or not alternate bids for concrete and asphalt runways should be invited. The test at Columbus answered that question. Neither the Air Force nor we have the competence to challenge the engineering conclusions of the Corps of Engineers.

3. The proof of market price is the market itself. It would cost far less for the Government to issue specifications on the alternate criteria proven by the Corps of Engineers and have the construction industry furnish the answers. Probably the most mature and soundest competitive industry in America today is the construction industry. It wants to bid. It will back up its bids with performance bonds. It is entitled to the opportunity of making its own market.

What this industry needs on these engineering conclusions is not the prejudgment of a phantom Government estimator but "an honest deck, dealt above the table."

Let us achieve economy in costs with two good legs for alternate bidding. Antispending drive should include the Air Force as a branch of the executive department.

RECOMMENDATIONS

The subcommittee recommends:

1. That the Department of the Air Force, the Corps of Engineers, U.S. Army, and, where affected thereby, the Department of Navy, accept, adopt, and implement the engineering conclusions made by the Corps of Engineers and presented to this subcommittee on December 2, 1958.

2. That the Department of the Air Force and Corps of Engineers or Navy Department, when acting for the Department of the Air Force or for its own account, specify as an alternate in all future bids, not only portland cement but asphaltic concrete of the design and on the criteria of December 2, 1958.

3. That the Navy Department immediately coordinate its studies and research with that of the Department of the Air Force and the Corps of Engineers, U.S. Army.

Approved by the subcommittee March 23, 1959.

F. EDWARD HÉBERT, *Chairman.*

Approved:

CARL VINSON,
Chairman, Committee on Armed Services.

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